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3.
The Qualitative Characteristics of Information Included in General Purpose Financial Reports by Public Sector Entities

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Introduction

The International Public Sector Accounting Standards Board (IPSASB) has recently published a Consultation Paper (IPSASB 2008) where it proposes the qualitative characteristics of information included in general purpose financial reports (GPFRs) by public sector entities. There is a major problem in the proposal. It is misleading because on the one hand it uses scientific terminology but on the other hand it gives the terminology a new meaning. This quasi-scientific approach to producing financial information creates an illusion of certainty that does not exist. Therefore the qualitative characteristics must be modified. That is the aim of this article.

The qualitative characteristics of information included in GPFRs are defined as the attributes that make that information useful to users for accountability purposes and for making various decisions. Concerning the terminology of these attributes, the following modifications will be proposed in this paper.

The concept of faithful representation that has been borrowed from the theory of measurement should be replaced with the more familiar concept of reliability. Relevance and reliability should be regarded as the two fundamental qualitative characteristics of useful financial reporting information (cf. IASB ED 2008, pp. 35-38). The concept of verifiability should be considered subordinate to reliability

and given its customary, more restricted scientific meaning. Moreover, to fill the resulting gap, the new concept of supportability should be introduced and defined. It should also be considered subordinate to reliability. In addition, all the constraining factors should be regarded as elements of sufficiency. Therefore, to ensure usefulness of the reported information, it should have the fundamental qualitative characteristics of *relevance* and *reliability* (or freedom from error, if you prefer) under the general constraint of *sufficiency*. These three key concepts are hierarchical as will be shown below.

The meaning of a conceptual framework

The Consultation Paper (IPSASB 2008) introduces the qualitative characteristics of information as elements of the conceptual framework. It does not define what "conceptual framework" means but the meaning becomes evident from the purpose that is given to it. The Paper explains that the IPSASB Framework will establish the concepts that underpin financial reporting by public sector entities that adopt the accrual basis of financial accounting (IPSASB 2008, p. 6). Therefore, the concept of framework has about the same meaning that, for example, Hendriksen and van Breda (1992, p. 22) give to the concept of (accounting) theory:

> "Accounting theory has been defined as a coherent set of logical principles that:
>
> 1. Provides a better understanding of existing practices to practitioners, investors, managers, and students.
> 2. Provides a conceptual framework for evaluating existing accounting practices.
> 3. Guides the development of new practices and procedures."

Here the word "theory" refers to an agreed-upon coherent set of logical principles expressed in specific terms. The same applies to the word "framework". The principles involved are selected to enhance understanding and thus facilitate communication. Such principles can never be refuted. There is no empirical evidence that could contradict with them. Therefore, the acceptance of any such theory is a matter of agreement rather than a matter of truth. This is in sharp contrast to what may be said about the more rigorous empirical theories. Their acceptance is based on the truth which must be established using the so called "scientific method".

Hence the concept of theory has two distinct meanings. It may be understood as a framework consisting of a set of coherent principles and underlying concepts that are formulated to enhance understanding or it may be understood as a deductive conceptual system for which the truth is established empirically by applying the scientific method. To elaborate the difference between these two views of a theory (or framework), let us take a closer look at the scientific method and its key concepts.

It is not a straightforward matter to explain briefly what the meaning of the scientific method is. The issue is complex because there are so many different techniques at the practical level. However, at the sufficiently general level one can identify a pattern in any empirical scientific research that may be called the "scientific method" (see, e.g., Cohen 1964, p. 79). In the heart of this pattern there is the cycle that is illustrated in Diagram 1 on the following page.

The cycle starts from observable empirical facts (phases 1 and 2). It continues with logical argumentation using those facts (phase 3) and theories or models (phase 4) to derive statements that are either theoretical propositions (phase 5a) or empirical propositions (i.e., hypotheses) (phase 5b). They offer a link back to observable real-world phenomena (phases 6 and 7). This link is crucial in verifying empirical theories. Verification (phase 8) connects theoretical thinking back to observable phenomena. It provides the observer with empirical evidence that may or may not support the proposed theory. When the

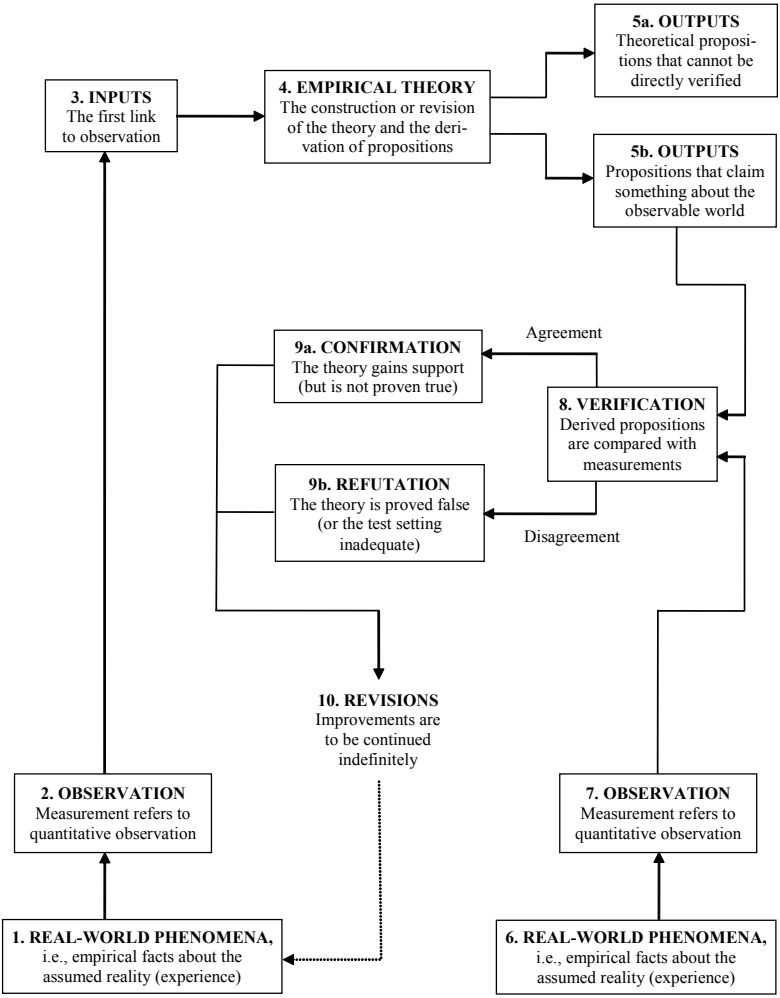

Diagram 1. The continuing cycle of scientific method

facts and hypotheses agree (phase 9a), the theory is said to be confirmed. It has gained empirical support. This does not mean, however, that it has been logically proven true because it is always possible that

the very same empirical propositions could have been derived from some competing but different theory. When the facts and hypotheses disagree (phase 9b), the theory together with the test setting is said to be refuted (or "falsified"). It has been logically proven that something is wrong somewhere and thus revisions are needed (phase 10). This process continues indefinitely.

Scientists have regarded this endless cycle as the distinctive characteristic of the scientific method. Let us take a few quotations. The first relates to the ultimate goal of empirical science. The goal is to produce true empirical knowledge. Therefore the crucial question is: When can one say that empirical knowledge is true? The truth of any empirical statement is said to depend on how well it corresponds to empirical facts. This important starting point is expressed quite clearly, for example, by Popper (1966, p. 369) (see Chambers 2002, p. 761) as he states: "…an assertion, proposition, statement or belief, is true if, and only if, it corresponds to the facts."

However, science and theories are not concerned with isolated empirical facts as can be seen in the typical definition of a scientific theory as a set of sentences or statements (AAA 1971, p. 54). The idea of a more comprehensive correspondence with a variety of empirical facts is also evident in the citation from Einstein (1935, p. 133) emphasizing that all knowledge of real-world phenomena must start from empirical experience and also end in it (see Chambers 2002, p. 753): "Pure logical thinking cannot yield us any knowledge of the empirical world; all knowledge of reality starts from experience and ends in it. Propositions arrived at by purely logical means are completely empty as regards reality."

Besides emphasizing the importance of empirical experience (that is, "real-world phenomena" in Diagram 1) the above citations also reflect the cyclic pattern of the scientific method. Even more explicitly, however, the endless continuity of this cycle is formulated by Homans and Curtis (1970, p. 21) (see Cambers 2002, p. 765): "To reach a theory, science observes certain facts and argues logically therefrom. The theory is submitted again to facts. The cycle is: observation, theory, verification, more observation, and so on forever."

The cyclic and self-correcting pattern of the scientific method is obvious in the above citation. However, it lacks two specific concepts (measurement and prediction) that relate to phases 2, 5b, and 7 in Diagram 1. To indicate their role, let us quote Walker (1963, p. 5), who includes these concepts in his definition of the scientific method: "The scientific method (1) postulates a model based on existing experimental observations or measurements; (2) checks the predictions of this model against further observations or measurements; (3) adjusts or replaces the model as required by the new observations or measurements. The third step leads back to the first step, and the process continues without end."

These citations show how important empirical observation is for scientific knowledge (phases 2 and 7 in Diagram 1). Logical thinking has also a role to play (phases 4, 5a, and 5b in Diagram 1) but it can never replace empirical observation. Therefore, human opinions, too, are of little value in producing scientific knowledge. Empirical facts are far more relevant. A scientist does not have to persuade anybody to think as he or she does, nor need a group of scientists reach consensus on matters being researched. It suffices that the empirical facts and the corresponding propositions agree. Goode and Hatt (1952, p. 7) formulate the very same point as follows (see Chambers 2002, p. 754): "Science is a method of approach to the entire empirical world… It is furthermore an approach which does not aim at persuasion, at the finding of ultimate truth…"

As a summary, few points may be repeated. First, scientific method consists of an endless cycle, where one starts from empirical observation and ends in empirical observation. Second, from this it follows that the concept of measurement must be inextricably linked to empirical observation. Third, the process of verification cannot be properly carried out without true measurements (see phases 8, 9a, and 9b in Diagram 1). Fourth, any attempt to verify without true measurements will lead to speculative information that does not meet the requirements of empirical science.

It is obvious that the IPSASB Framework is not proposed as an application of the scientific method. It is not a refutable empirical theory. Therefore it is misleading to adopt terms from the scientific method but not their meaning. To the extent that scientific terms are being used, one should also accept their meaning as a given fact. To follow this principle, one must modify the qualitative characteristics proposed in the Consultation Paper (IPSASB 2008, pp. 31-39).

The qualitative characteristics of information included in GPFRs

The qualitative characteristics of information included in GPFRs were defined above. It will be suggested here that the terminology of these characteristics and the underlying concepts should be modified and portrayed hierarchically. In addition, to evaluate whether the information to be disclosed really has the required qualitative characteristics, their presence should be considered in a process comparable to that of the scientific method.

The Consultation Paper (IPSASB 2008, p. 7 and p. 9) identifies the following qualitative characteristics: relevance, faithful representation, understandability, timeliness, comparability, and verifiability. Materiality, cost and achieving an appropriate balance between the qualitative characteristics are then given as pervasive constraints on that information. Relevance is considered to encompass confirmatory value, predictive value, or both (IPSASB CP 2008, p. 32). Faithful representation is claimed to be attained when the depiction of economic or other phenomena is complete, neutral, and free from material error (page 33). The only indication of a hierarchy is the distinction between the attributes that are called the qualitative characteristics of information and the attributes that are called the constraints on that information.

Here it is proposed that to ensure the usefulness of the information in financial reports, it should have the fundamental qualitative characteristics of (1) *relevance* and (2) *reliability* (or freedom from error) under the general constraint of (3) *sufficiency*. The two fundamental qualitative characteristics may be seen to encompass several enhancing qualitative characteristics (cf. IASB ED 2008, pp. 38-41). For relevance they are (1a) *confirmatory value*, (1b) *predictive value*, (1c) *understandability*, (1d) *timeliness* and (1e) *comparability*. Similarly for reliability the enhancing qualitative characteristics are (2a) *verifiability* and (2b) *supportability*. The two fundamental qualitative characteristics are not absolute but show in degrees. Therefore the general constraint of sufficiency must be introduced and adopted. It consists of the requirement to achieve a balance between the ideal requirement of (3a) *completeness* and the following moderating elements: (3b) *neutrality*, (3c) *materiality* and (3d) *cost-benefit-reasonableness*.

The Consultation Paper (IPSASB 2008, p. 32) defines *relevance* as follows: "Information is relevant if it is capable of making a difference in achieving the objectives of financial reporting – that is, in the discharge of the entity's accountability obligations or in the decisions made by users of GPFRs." This is a good, comprehensive definition. It encompasses both *confirmatory value* and *predictive value* as mentioned in the Paper. In addition, it encompasses even more making thus redundant (or at least subordinate) several of the attributes proposed in the Paper.

First, the attribute of *understandability* (defined on page 35 as the quality of information that enables users to comprehend its meaning) is redundant to relevance. How could information be relevant to a person without first being understandable to him or her? In precisely the same way that understandability is dependent on a person's education and knowledge, relevance, too, is dependent on such matters. The Paper (IPSASB 2008, p. 35) explains that understandability may be enhanced in many ways. For example, comparability is said to enhance understandability. Precisely in the same way it may be said that understandability enhances relevance. Therefore, relevance may be said

to encompass understandability. In other words, understandability may be considered an enhancing qualitative characteristic of relevance.

Second, the attribute of *timeliness* (defined on page 35 in terms of having information available to users before it loses its capacity to be useful for accountability and decision-making purposes) is redundant to relevance for the same reason. No matter how potentially useful a piece of information may be, this potential will be lost if the piece of information is not available at the proper point in time. Therefore, the attribute of timeliness is also a distinct feature of relevance rather than a parallel qualitative characteristic of financial information. In other words, timeliness, too, may be regarded as an enhancing qualitative characteristic of relevance.

Third, the attribute of *comparability* (defined on page 36 as the quality of information that enables users to identify similarities in, and differences between, two sets of phenomena) is also redundant. Comparability is encompassed by relevance. This should be evident if one considers the opposite. How could a piece of information be relevant if there were no way to compare it with any other piece of information? For example, the piece of information saying that X has the value of 20 per cent is meaningless as long as one is unable to compare it with something else. Therefore it cannot be relevant, either. The situation would change essentially, if one learned that the value of X is typically less than a half of the return on investment in the same conditions. This new piece of information would not only make the first piece of information comparable to a known variable but it would also make it highly relevant. Thus the attribute of comparability should also be considered a distinct feature of relevance, that is, an enhancing qualitative characteristic of relevance, rather than a parallel qualitative characteristic of financial information.

What is claimed here is that the concept of relevance is even more powerful than the Paper acknowledges. It does not only encompass confirmatory value and predictive value but also such features as understandability, timeliness and comparability. Therefore any piece of information that (a) has either confirmatory value or predictive value

and (b) at the same time is understandable, available at the proper time, and comparable to some other interesting pieces of information, is relevant. And conversely, a piece of information is not relevant even if it potentially has confirmatory value or predictive value but it is not in an understandable form, or it is not available when needed, or it cannot be compared to anything that is meaningful to the user.

Besides relevance, the Paper also regards *faithful representation* as a necessary qualitative characteristic of useful information in financial reporting. It argues that a piece of information is a faithful representation of the economic or other phenomenon that it purports to represent when the depiction of the phenomenon is complete, neutral, and free from material error (IPSASB 2008, p. 33). Moreover, the Paper implies (see, e.g., pages 9, 28 and 29) that prospective information about the future might also serve as a faithful representation of something.

Such arguments and implications are problematic, however, because they give the term "faithful representation" a totally new meaning that is very different from its established meaning in the theory of measurement. There faithful representation is related to quantification which must be made so that the functional correspondence between the degrees of the observable property and the numbers assigned to these degrees become a faithful representation. The issue of how to create a proper functional correspondence is called the representation problem (see, e.g., Krantz et al. 1971, Scott & Suppes 1969, Suppes & Zinnes 1963), and it is concerned with the isomorphism between the *observable* degrees of the given property in an empirical system and the relational numerical system selected to represent the empirical system.

This means that the property being faithfully represented for measurement purposes must be *observable*. However, the future cannot be observed. Therefore there is no way in practice to achieve a faithful representation of any future phenomenon. Consequently the term "faithful representation" should not be used in this new context where empirical observation is not required. Of course, it could not even be required, and that is so because faithful representation is extended to

concern the future, too. But since future phenomena cannot be currently observed, talking about faithful representation of them is simply misleading and should be stopped.

Instead of faithful representation, one should talk about reliability of information. *Reliability* refers to freedom from error and nothing else. One should not even say that reliability refers to freedom from *material* error, which would make the definition equal to one of the qualitative characteristics of faithful representation (IPSASB 2008, p. 33). This is so because it is just freedom from error, not materiality of it that should be considered fundamental. Materiality is only related to the degree of this fundamental characteristic that one may want to consider sufficient in any given case. Materiality is thus only a moderating factor, not a distinct feature of the fundamental qualitative characteristic.

This raises the question of how reliability may be established. How could one know whether a piece of information is reliable or not? The best answer is to apply the scientific method as shown in Diagram 1. This means that one should first and foremost try to verify the truth of the given empirical statement by comparing it with what may be observed. This process is called verification. A statement is verifiable if its truth can be verified. Here it is proposed that *verifiability* in this sense should be the first enhancing characteristic of reliability. Actually this is nothing new. The meaning of verifiability in this sense is essentially equivalent to that of direct verifiability in the IASB Exposure Draft (2008, p. 40).

Verifiability is truly a desired qualitative characteristic but in many cases it is too demanding. Therefore one may ask what the next step should be if a piece of information cannot be verified. The answer might be taken from auditing. It may be required to check the inputs and recalculate the corresponding outputs. Such checking would not be verification but rather auditing that gives support and credibility to information. One may then say that a piece of information is supportable if it is possible for different knowledgeable and independent observers to reach general consensus that the methods used in produ-

cing the information have been properly applied (cf. IASB ED 2008, pp. 39-40 and IPSASB 2008, pp. 36-37). Consequently, one may say that *supportability* is the second enhancing characteristic of reliability. Its meaning is essentially equivalent to that of indirect verifiability in the IASB Exposure Draft (2008, p. 40).

Whether even supportability is to be required before a piece of information may be disclosed is an open question. It is possible that a piece of information that can neither be verified nor even properly supported is so relevant that it would be useful to users although its reliability cannot be independently verified or checked. The IASB Exposure Draft (2008, p. 52) gives management's intentions as an example of a piece of information that perhaps can neither be verified (directly verified) nor supported (indirectly verified). Yet it may be useful to users.

Relevance and reliability are thus the two fundamental qualitative characteristics of financial information. That is, if the user has all the relevant information and it is completely reliable, he or she would need nothing else. Usefulness of information would be secured. However, relevance and reliability are not absolute concepts but show in degrees. Therefore, as the first step, it was above stated what the additional qualitative characteristics are that enhance these fundamental characteristics. The second step will now be to set limits to enhancing. The question is: when does a user have enough of relevant information that is reliable to the required degree? In other words: when is the supplied information sufficient to the user?

The concept of *sufficiency* is a moderating concept that aims at an acceptable balance between the qualitative characteristics in terms of a few selected dimensions. The dimensions of moderation are completeness, neutrality, materiality and cost-benefit-reasonableness. Because it is not practicable to produce and disclose every piece of relevant information with absolute reliability to all potential users, it must then be asked what is practicable and sufficient. The answer is briefly discussed in terms of the given four dimensions.

Completeness establishes the fundamental starting point to disclose all the information that is relevant. That is, if a piece of information is capable of making a difference in achieving the objectives of financial reporting, then it should be produced and disclosed. This is an extreme requirement demanding that not only part of relevant information should be available but all of it. Without moderation, however, this requirement would result in great practical difficulties but it is a necessary starting point.

Neutrality is defined in the Paper as "the absence of bias that is intended to attain a predetermined result or to induce a particular behavior" (IPSASB 2008, p. 33). The Paper adds: "Neutral information is free from bias, so that it faithfully represents the economic and other phenomena that it purports to represent." Taken literally this means that neutrality is actually redundant to the proposed system. If it is taken to mean that one is not allowed to select or present information so that it favors some particular perspective, say, an interest group then it is simply redundant to requiring that the set of relevant information to be disclosed should be complete. If pieces of information were left out that are relevant from some perspective, then the disclosed set would not be complete. On the other hand, if it is taken to mean that one is not allowed to present information so that it is excessively cautious or in some other way biased then it is simply redundant to requiring that the set of relevant information to be disclosed should be reliable. A biased piece of information can never be the best estimate in terms of reliability. Therefore, the complete set of relevant and reliable information is necessarily sufficient for making neutral estimates of the financial conditions and hence, as a distinct qualitative characteristic, neutrality is redundant.

However, if neutrality is interpreted as a moderating characteristic then it has a role to play. In this role neutrality is taken to mean that it is sufficient to report information for general purposes instead of tailoring it for the purposes of any particular interest groups. The "general purpose" implies that the selection and presentation of financial information are not biased to serve particularly any specific

groups or goals but "neutrally" to all groups that are interested in the financial information of the entity. In this sense neutrality moderates the requirement of completeness.

Materiality is regarded as a pervasive constraint in the Consultation Paper (IPSASB 2008, p. 38). That is a misleading statement in a way. Rather than being a pervasive constraint materiality is a pervasive moderating factor. Instead of requiring the complete set of relevant financial information, it is sufficient to require all the relevant information that is material with respect to the objectives of financial reporting, that is, serving the discharge of accountability by the entity for the reporting period and serving the decisions that users make on the basis of the entity's GPFRs prepared for that period. Similarly, instead of requiring complete freedom from error in the reporting of relevant financial information, it is sufficient to require that all the disclosed information is free from material error. Therefore, materiality is clearly a dimension of sufficiency.

The Consultation Paper does not acknowledge that materiality is a moderating factor. This becomes evident in the discussion on faithful representation which is claimed to be "attained when the depiction of the phenomenon is complete, neutral, and free from *material* [emphasis added] error" (IPSASB 2008, p. 33). Faithful representation, or reliability, simply refers to freedom from error, however, not to freedom from material error, and it is a distinct issue to consider the extent to which this characteristic should be required. Completeness is thus the starting point and materiality is the factor that moderates this extreme requirement.

Cost-benefit-reasonableness refers to requiring that the benefits of financial reporting should justify the costs that it imposes (IPSASB 2008, p. 38). From the economic perspective this requirement is clearly acceptable. However, it is also a moderating requirement. It asserts that rather than requiring the complete set of relevant information with perfect reliability it is only economically reasonable to require information for which the related benefits justify the corresponding cost. This means that for economic reasons less than perfect information may

be sufficient. The principle is simple and clear but it may be difficult to apply. Assessing whether the benefits of providing information really justify the related cost will typically be more qualitative than quantitative. The question is then a little ambiguous asking whether one or more qualitative characteristics should be sacrificed to "some degree" in order to reduce costs.

Diagram 2 on the following page summarizes the above discussion on the qualitative characteristics of information in GPFRs. The evaluation of a potentially useful piece of information starts from asking whether it has the first fundamental qualitative characteristic of being relevant, that is, whether it is capable of making a difference in achieving the objectives. If the answer is "no", the piece of information is useless and no further analysis is needed. If the answer is "yes", one must ask if the piece of information has the second fundamental qualitative characteristic of being reliable, that is, whether it is free from error. Again, if the answer is "no", the piece of information is useless and it should not be disclosed. If the answer is "yes", then this piece of relevant information has the proper characteristics and should be disclosed.

This is an ideal picture of the evaluation process. In practice it becomes more complicated because the fundamental qualitative characteristics of relevance and reliability are not absolute but show in degrees. Therefore, one must introduce enhancing qualitative characteristics for the both of these fundamental characteristics. For relevance they are confirmatory value, predictive value, understandability, timeliness and comparability. An increase in the attainment of any of these characteristics enhances relevance. For reliability the enhancing characteristics are verifiability and supportability. An increase in the attainment of these characteristics enhances reliability.

Enhancing could be performed without an end. Therefore one must ask what amount of enhancing is sufficient. Consequently sufficiency becomes the moderating factor. As such it is too ambiguous and therefore it must be made more specific by introducing some dimensions to it. Four dimensions of moderation were proposed:

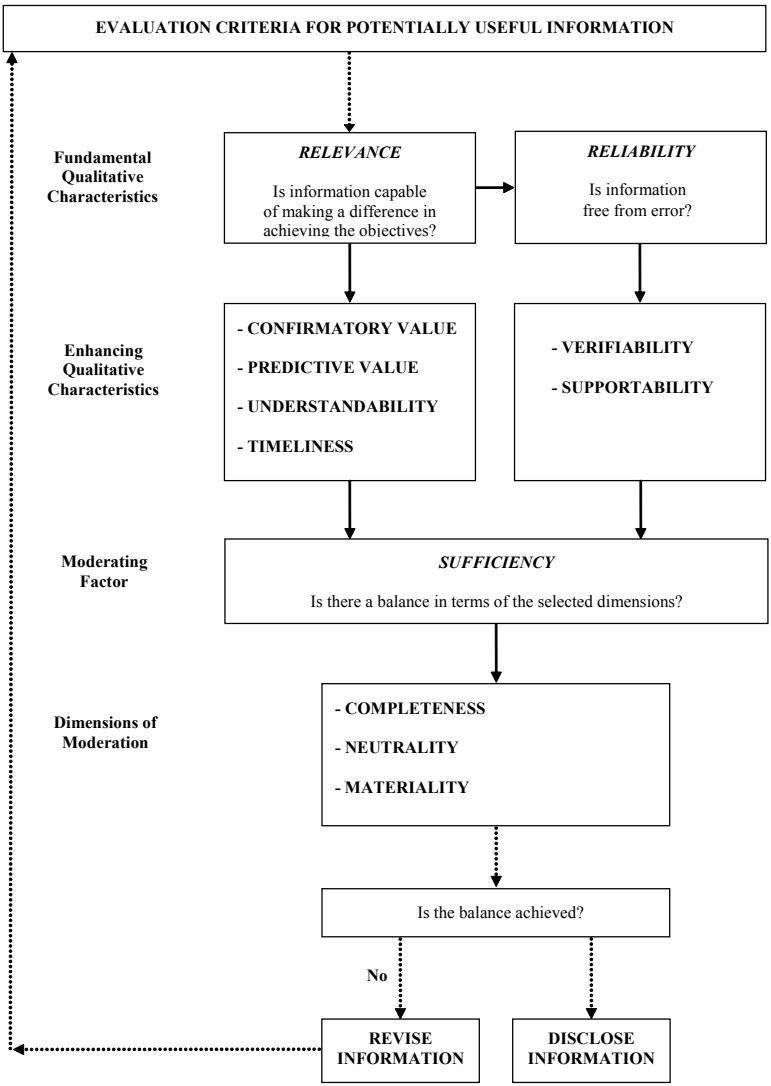

Diagram 2. The qualitative characteristics of information in GPFRs

completeness, neutrality, materiality and cost-benefit-reasonableness. Therefore, sufficiency reduces to asking if there is a balance between

the given qualitative characteristics in terms of the selected dimensions of moderation. Assessing whether the balance is in fact achieved will typically be more qualitative than quantitative.

Concluding remarks

The term "conceptual framework" may have two distinct meanings supported by two different approaches. The big problem with the IPSASB Framework is that it takes the meaning from the one approach but the terminology from the other. This will result in misunderstandings. The most harmful of them is the illusion of certainty in the disclosed information.

The second problem with the IPSASB Framework concerns the qualitative characteristics it proposes. More specifically, faithful representation and verifiability are misleading in this context. They are adopted from the scientific method but they are both given a new meaning. These homemade constructs give the illusion of a scientific approach to producing information that only turns out to be quasi-scientific (see, e.g., Vehmanen 2007, pp. 152-168). Adopting a quasi-scientific framework would only raise false expectations regarding the certainty of the reported information. Therefore, the terminology of the framework should be modified to better match the level of certainty that may be achieved in financial reporting. The required modifications were presented above.

References

American Accounting Association (AAA) 1971. Report of the Committee on Foundations of Accounting Measurement. *The Accounting Review*, Supplement to Vol. XLVI.

Chambers, R. J. 2002. *An Accounting Thesaurus: 500 Years of Accounting.* Amsterdam: Pergamon, Elsevier Science.

Cohen, M. R. 1964. *Reason and Nature: An Essay on the Meaning of Scientific Method.* New York: Free Press.

Einstein, A. 1935. *The World As I See It.* London: Lane & Bodley Head.

Goode, W. J. & Hatt, P. K. 1952. *Methods in Social Research.* New York: McGraw-Hill.

Hendriksen, E. S. & van Breda, M. F. 1992. *Accounting Theory.* Chicago: Irwin.

Homans, G. C. & Curtis, C. P. 1970. *An Introduction to Pareto.* New York: Howard Fertig.

IASB Exposure Draft, May 2008. *An improved Conceptual Framework for Financial Reporting – Chapter 1, The Objective of Financial Reporting; Chapter 2, Qualitative Characteristics and Constraints of Decision-useful Financial Reporting Information.* London: IASC Foundation Publications Department.

IPSASB Consultation Paper, September 2008. *Conceptual Framework for General Purpose Financial Reporting by Public Sector Entities – The Objectives of Financial Reporting, The Scope of Financial Reporting, The Qualitative Characteristics of Information Included in General Purpose Financial Reports, The Reporting Entity.* Toronto: The International Federation of Accountants, IFAC.

Krantz, D. H. & Luce, R. D. & Suppes, P. & Tversky, A. 1971. *Foundations of Measurement, Vol. I, Additive and Polynomial Representations.* New York: Academic Press.

Popper, K. R. 1966. *The Open Society and Its Enemies.* Princeton: Princeton University Press, Volume II.

Scott, D. & Suppes, P. 1969. A Set of Independent Axioms for Extensive Quantities. In Suppes, P. (ed.) *Studies in the Methodology and Foundations of Science.* Dordrecht, Holland: Reidel.

Suppes, P. & Zinnes, J. L. 1963. Basic Measurement Theory. In Luce, R. D. & Bush, R. R. & Galanter, E. (eds.) *Handbook of Mathematical Psychology, Vol. I.* New York: Wiley.

Vehmanen, P. 2007. Measurement in Accounting and Fair Value. In Walton, P. (ed.) *The Routledge Companion to Fair Value and Financial Reporting.* London and New York: Routledge.

Walker, M. 1963. *The Nature of Scientific Thought.* New York: Prentice-Hall.